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Bellcomm, Inc.

SUBJECT: Trip Report - Meeting of the
Apollo Test Integration Working
Group (ATIWG) at KSC; Discussions
on the Boeing Simulation Model
with MSFC/Boeing - Case 330

DATE: October 11, 1967

FROM: C. H. Eley III

ABSTRACT

This memorandum reports on a meeting of the Apollo Test Integration Working Group (ATIWG) at KSC on October 3, 1967, and discussions with Boeing and MSFC personnel at MSFC on October 5, 1967.

Major activities discussed during the ATIWG meeting concerned the S-IB program only. These discussions included the countdown sequence for AS-204/LM-1, the protective covering for the IU during LM hypergolic servicing; and procedures to protect the LM-1 mission programmer from inadvertent signals during terminal phase of count which could possibly fire the RCS engines or ordnance devices.

The meeting with Boeing and MSFC personnel produced some beneficial discussions concerning the capabilities of the Boeing computer simulation model and its potential with an expanded scope to support the Apollo program objective of achieving a launch-on-time capability.

(NASA-CR-90665) TRIP REPORT - MEETING OF
THE APOLLO TEST INTEGRATION WORKING GROUP
/ATIWG/ AT KSC, DISCUSSIONS ON THE BOEING
SIMULATION MODEL WITH MSFC/BOEING (Bellcomm,
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MEMORANDUM FOR FILE

1. INTRODUCTION

A meeting of the Apollo Test Integration Working Group (ATIWG) was held at KSC on October 3, 1967. Only the Saturn IB portion of the meeting was held due to the on-going Countdown Demonstration Test (CDDT) for AS-501. The meeting was chaired by A. C. Griffin. In addition to the meeting of the ATIWG, the author had an opportunity to visit the LCC and observe the progress of the CDDT.

On October 5, a conference was held at MSFC/Boeing concerning possible expansion and modification of the Boeing computer simulation model to support the Apollo program objective of achieving a launch on-time capability for the Apollo/Saturn V. Representatives at the conference included Lucian Bell and Carroll Jones of MSFC; W. B. Gevarter, R. V. Sperry and the author from Bellcomm; J. E. Snyder and Y. H. Lindsey of Boeing, and other Boeing personnel.




2. MEETING OF THE ATIWG

The new countdown sequence for AS-204/LM-1 was discussed with regard to the status of the "hold points" in the countdown. These hold points are actually status points where problems are identified if they exist at that time. The following is a current list of these hold points.

T-COUNT

FUNCTION

| | |
|-------------|-------------------------------|
| T-72:30 hr. | LV power on (pre-count phase) |
| T-39 hr. | LV power on (midcount phase) |
| T-28 hr. | S-IVB mechanical closeout |
| T-20:30 hr. | Carry-on cable removal |

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| <u>T-COUNT (Cont'd)</u> | <u>FUNCTION (Cont'd)</u> |
|-------------------------|---------------------------------|
| T-18 hr. | SHe GSE removal |
| T-14 hr. | LV batt. install/cabin closeout |
| T-11:30 hr. | LM SLA platform removal |
| T-10 hr. | LV powr on (launch count phase) |
| T-6 hr. | pad clear (LV S&A connect) |
| T-3 hr. | pad clear (LV LOX load) |
| T-1 hr. | S-IVB LH ₂ load |
| T-45 min. | Start terminal count |
| T-20 min. | S-IVB chilldown sequence |
| T-3 min. | Automatic launch sequence |

MSFC is currently taking action to provide the protective covering for the IU during LM hypergolic servicing. This cover, or curtain, is constructed of graphite impregnated teflon-coated, reinforced fiber glass. This material is reported to be completely fireproof, but is not the final word in protection. MSFC, however, is fabricating the curtain only for AS-204/LM-1--something else is needed for the next vehicle. KSC is therefore looking to MSC to provide subsequent action on protection for future vehicles. It was recently requested by the MSFC S-IB Program Manager that AS-204 and AS-205 be targeted to launch "on time" so as to provide system rehearsal for the AS-207/206 mission. "On-time launch" is defined as a 0-6 second window while a "near on-time launch" is defined as 0-7 minute window. Possible changes to the AS-204 and 205 countdowns were discussed which might assure an on-time launch (including built-in holds). One opinion expressed was that the best way to achieve this is to keep task completion ahead of the countdown sequence. This type of operation, however, has its drawbacks--it is especially conducive to dangerous procedural conflicts. KSC has also been directed (from within) to run all countdown procedures per the countdown clock. It was announced that future discussions concerning short-launch window considerations and dual launches will be handled through the ATIWG rather than a separate working group.

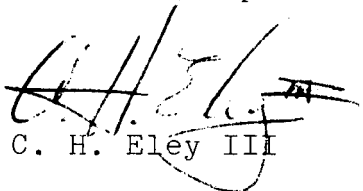
Mr. Bob Harrington expressed some concern with the design and operation of the LM-1 mission programmer. There is a fear that an inadvertent signal during the terminal phase of countdown could possibly fire the RCS engines and/or ordnance devices. No remote (umbilical) control currently exists for turning on and off the DCA. Since LM-1 is unmanned, the DCA must therefore be turned on during cabin closeout (T-12.5 hours), and left on. It should be noted that the

receiver is "uncaptured" during periods in the countdown when no 450 mhz RF carrier is present. There is a fear that in such an uncaptured state the receiver and decoding networks could be susceptible to noise transients and accept a command which was never sent and/or a command which could be inadvertently sent. MSC protects their command system against sending the wrong command by a combination of two correctly coded signals. Any incorrectly coded signals cannot get into the LM to activate the PRA Reader Assembly. There is, however, a period in the latter stages of the launch countdown when the command system is activated to a high level of readiness to conduct a relay check. It is during this period that all procedures need to be firmed-up to prevent the possibility of an inadvertent command. One comment which particularly applies is that "if it can happen, it will."

3. CONFERENCE WITH MSFC/BOEING

The author in attendance with R. V. Sperry and W. B. Gevarter visited the Boeing Co. in Huntsville for discussions concerning the Boeing computer simulation model of launch vehicle/MGSE operations. The Boeing model is potentially a very effective tool which could be used to support the Apollo program objective of achieving a launch on-time capability. There are some drawbacks, however, to using the Boeing model in its present form. The model is currently limited in scope, and would have to be expanded to include the entire Apollo/Saturn V system. This appears to be a fairly large order at first glance, but could be accomplished within a reasonable time frame. A starting point for the spacecraft, for instance, might be to obtain lists (which are available) of those items which can be repaired and/or replaced in the stacked condition--including hard data on reliability, etc. Some changes in the model's simulation philosophy would also be needed. R. V. Sperry and W. B. Gevarter discussed the simulation philosophy and technique at length with Boeing. It should be noted that this or any modeling effort must show some cross-correlation between predicted and actual performance before a decision is made to expand the scope of the model. It should also be noted that MSFC feels correlation is possible and expects to show some results within a few months.

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